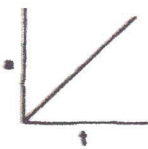
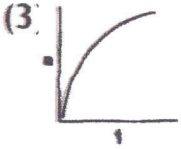
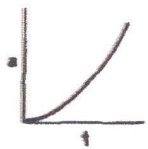
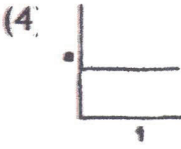


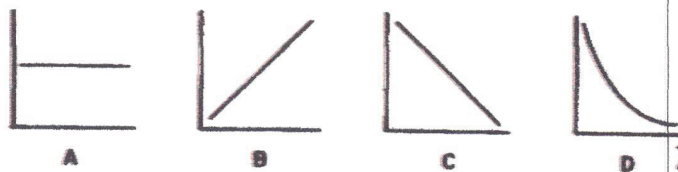
1. The average velocity of an object during 6.0 seconds is 2 meters per second. What is the total distance traveled by the object?
(1) $1/3$ m (3) 3 m
(2) 12 m (4) 4 m
2. A car travels 20. meters east in 1.0 second. The displacement of the car at the end of this 1.0-second interval is
(1) 20. m (3) 20. m east
(2) 20. m/s (4) 20. m/s east
3. The average speed of a plane was 600 kilometers per hour. How long did it take the plane to travel 120 kilometers?
(1) 0.2 hour (3) 0.7 hour
(2) 0.5 hour (4) 5 hours
4. A group of bike riders took a 4.0-hour trip. During the first 3.0 hours, they traveled a total of 50. kilometers, but during the last hour they traveled only 10. kilometers. What was the group's average speed for the entire trip?
(1) 15 km/hr (3) 40. km/hr
(2) 30. km/hr (4) 60. km/hr
5. What is the average velocity of a car that travels 30. kilometers due west in 0.50 hour?
(1) 15 km/hr (3) 15 km/hr west
(2) 60. km/hr (4) 60. km/hr west
6. As a cart travels around a horizontal circular track, the cart *must* undergo a change in
(1) velocity (3) speed
(2) inertia (4) weight
7. A baseball pitcher throws a fastball at 42 meters per second. If the batter is 18 meters from the pitcher, approximately how much time does it take for the ball to reach the batter?
(1) 1.9 s (3) 0.86 s
(2) 2.3 s (4) 0.43 s
8. A car moving at a speed of 8.0 meters per second enters a highway and accelerates at 3.0 m/s^2 . How fast will the car be moving after it has accelerated for 56 meters?
(1) 24 m/s (3) 18 m/s
(2) 20. m/s (4) 4.0 m/s
9. Base your answer on the information below.

A 1,000-kilogram car traveling with a velocity of +20. meters per second decelerates uniformly at -5.0 m/s^2 until it comes to rest.

What is the total distance the car travels as it decelerates to rest?
(1) 10. m (3) 40. m
(2) 20. m (4) 80. m

10. A car having an initial speed of 16 meters per second is uniformly brought to rest in 4.0 seconds. How far does the car travel during this 4.0-second interval?
- (1) 32 m (3) 96 m
(2) 82 m (4) 4.0 m
11. A boat initially traveling at 10. meters per second accelerates uniformly at the rate of 5.0 meters per second² for 10. seconds. How far does the boat travel during this time?
- (1) 50. m (3) 350 m
(2) 250 m (4) 500 m
12. A cart moving across a level surface accelerates uniformly at 1.0 meter per second² for 2.0 seconds. What additional information is required to determine the distance traveled by the cart during this 2.0-second interval?
- (1) coefficient of friction between the cart and the surface
(2) mass of the cart
(3) net force acting on the cart 4 initial velocity of the cart
(4) initial velocity of the cart
13. Starting from rest, an object rolls freely down an incline that is 10 meters long in 2 seconds. The acceleration of the object is approximately
- (1) 5 m/sec (3) 10 m/sec
(2) 5 m/sec² (4) 10 m/sec²
14. A car is accelerated at 4.0 m/s² from rest. The car will reach a speed of 28 meters per second at the end of
- (1) 3.5 sec. (3) 14 sec.
(2) 7.0 sec. (4) 24 sec.
15. Base your answer on the information below:
- A 10.-kilogram object, starting from rest, slides down a frictionless incline with a constant acceleration of 2.0 m/sec² for four seconds.
- Which graph below best represents the relationship between acceleration (a) and time (t) for the object?
- (1)  (3) 
- (2)  (4) 

16. Base your answer on the graphs below which represent various phenomena in physics. [Note: A graph may be used more than once.]



Which graph best represents the relationship between velocity and time for an object thrown vertically upward near the surface of the Earth?

- (1) A (3) C
(2) B (4) D
17. An object falls freely from rest near the surface of the Earth. What is the speed of the object when it has fallen 4.9 meters from its rest position?
- (1) 4.9 m/s (3) 24 m/s
(2) 9.8 m/s (4) 96 m/s
18. A rock falls freely from rest near the surface of a planet where the acceleration due to gravity is 4.0 m/s^2 . What is the speed of this rock after it falls 32 meters?
- (1) 8.0 m/s (3) 25 m/s
(2) 16 m/s (4) 32 m/s

19. A clam dropped by a sea gull takes 3.0 seconds to hit the ground. What is the sea gull's approximate height above the ground at the time the clam was dropped?

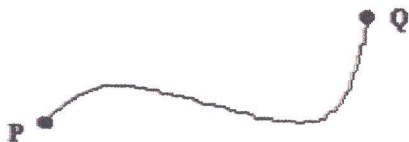
- (1) 15 m (3) 45 m
(2) 30. m (4) 90. m

20. In an experiment that measures how fast a student reacts, a meter stick dropped from rest falls 0.20 meter before the student catches it. The reaction time of the student is approximately

- (1) 0.10 s (3) 0.30 s
(2) 0.20 s (4) 0.40 s

Kinematics

1. A particle travels along a curved path between two points P and Q as shown. The displacement of the particle does *not* depend on



- A) the location of P.
 B) the location of Q.
 C) the distance traveled from P to Q.
 D) the shortest distance between P and Q.
 E) the direction of Q from P.
2. In the process of delivering mail, a postal worker walks 161 m, due east from his truck. He then turns around and walks 194 m, due west from his truck. What is the worker's displacement relative to his truck?
 A) 33 m, due west
 B) 33 m, due east
 C) 194 m, due west
 D) 252 m, due east
 E) 355 m, due west
3. When the outdoor emergency warning siren at Cheryl's school was tested, the sound from the siren took 7.0 s to reach her house located 2.40 km from the school. What is the speed of sound in air?
 A) 240 m/s B) 340 m/s C) 440 m/s D) 540 m/s E) 640 m/s
4. A bus leaves New York City, takes a non-direct route and arrives in St. Louis, Missouri 23 hours, 16 minutes later. If the distance between the two cities is 1250 km, what is the magnitude of the bus' average velocity?
 A) 37.2 km/h B) 41.4 km/h C) 46.0 km/h D) 53.7 km/h E) 58.1 km/h
5. Carole's hair grows with an average speed of 3.5×10^{-9} m/s. How long does it take for her hair to grow 0.30 m? Note: $1 \text{ yr} = 3.156 \times 10^7 \text{ s}$.
 A) 1.9 yr B) 1.3 yr C) 0.37 yr D) 5.4 yr E) 2.7 yr

Kinematics

B

6. A pitcher delivers a fast ball with a velocity of 43 m/s to the south. The batter hits the ball and gives it a velocity of 51 m/s to the north. What was the average acceleration of the ball during the 1.0 ms when it was in contact with the bat?
- A) $4.3 \times 10^4 \text{ m/s}^2$, south D) $2.2 \times 10^3 \text{ m/s}^2$, south
B) $5.1 \times 10^4 \text{ m/s}^2$, north E) $7.0 \times 10^3 \text{ m/s}^2$, north
C) $9.4 \times 10^4 \text{ m/s}^2$, north
7. A ball is thrown vertically upward from the surface of the earth. Consider the following quantities:
(1) the speed of the ball; (2) the velocity of the ball; (3) the acceleration of the ball.
Which of these is (are) zero when the ball has reached the maximum height?
A) 1 only B) 2 only C) 1 and 2 D) 1 and 3 E) 1, 2, and 3
8. A brick is dropped from rest from a height of 4.9 m. How long does it take for the brick to reach the ground?
A) 0.6 s B) 1.0 s C) 1.2 s D) 1.4 s E) 2.0 s
9. What maximum height will be reached by a stone thrown straight up with an initial speed of 35 m/s?
A) 98 m B) 160 m C) 41 m D) 62 m E) 18 m

Use the following to answer questions 10-12:

A ball is shot straight up from the surface of the earth with an initial speed of 19.6 m/s. Neglect any effects due to air resistance.

10. What is the magnitude of the ball's displacement from the starting point after 1.00 second has elapsed?
A) 9.80 m B) 14.7 m C) 19.6 m D) 24.5 m E) 58.8 m
11. What maximum height will the ball reach?
A) 9.80 m B) 14.7 m C) 19.6 m D) 24.5 m E) 58.8 m

B25

B

Kinematics

12. How much time elapses between the throwing of the ball and its return to the original launch point?
A) 4.00 s B) 2.00 s C) 12.0 s D) 8.00 s E) 16.0 s

Use the following to answer questions 13-16:

A tennis ball is shot vertically upward in an *evacuated chamber* with an initial speed of 20.0 m/s at time $t = 0$ s.

13. How high does the ball rise?
A) 10.2 m B) 20.4 m C) 40.8 m D) 72.4 m E) 98.0 m
14. Approximately how long does it take the tennis ball to reach its maximum height?
A) 0.50 s B) 2.04 s C) 4.08 s D) 6.08 s E) 9.80 s
15. Determine the velocity of the ball at $t = 3.00$ seconds.
A) 9.40 m/s, downward D) 38.8 m/s, upward
B) 9.40 m/s, upward E) 38.8 m/s, downward
C) 29.4 m/s, downward
16. What is the magnitude of the acceleration of the ball when it is at its highest point?
A) 0 m/s² B) 9.80 m/s² C) 19.6 m/s² D) 4.90 m/s² E) 3.13 m/s²

B26